WHAT IS CLAIMED IS:

1. A micromachined device, characterized by:

a semiconductor body;

an intermediate layer on top of said semiconductor body;

a substrate of semiconductor material, on top of said intermediate layer;

a cavity extending in said intermediate layer, said cavity delimiting laterally bottom fixed regions and being delimited at the top by said substrate and at the bottom by said semiconductor body;

an oscillating element formed in said substrate above said cavity;

trenches extending through said substrate, said trenches insulating said oscillating element from top fixed regions;

said oscillating element comprising an oscillating platform and mobile electrodes extending towards said top fixed regions;

said bottom fixed regions forming fixed electrodes that extend in said intermediate layer towards the inside of said cavity and are staggered with respect to said mobile electrodes.

2. The device according to claim 1, further comprising a bonding structure, arranged between said semiconductor body and said intermediate layer.

3. The device according to claim 1, further comprising an insulating layer arranged between said intermediate layer and said substrate, electrical-connection regions extending through said insulating layer between said top fixed regions and said bottom fixed regions.

4. The device according to claim 3, wherein said substrate has a top surface, and wherein metal contacts are formed above said top surface in direct electrical contact with said top fixed regions and said oscillating element.

5. The device according to claim 1, wherein said oscillating element forms a mirror element of an optical switch further comprising a pair of anchoring regions and a pair of supporting arms extending between each anchoring region and said platform.

6. The device according to claim 5, wherein said mobile electrodes extend from said platform towards said top fixed regions.

7. The device according to claim 2, wherein said bonding structure is formed by an insulating material layer arranged between said semiconductor body and said intermediate layer.

8. The device according to claim 2, wherein said semiconductor body houses electronic components and is coated with an insulating material layer, and said bonding structure comprises electrically conductive regions arranged on top of said insulating material layer, said electrically conductive regions being in direct electrical contact with at least said bottom fixed regions and with electrical-connection regions formed in said insulating material layer for electrical connection between said electronic components and at least said bottom fixed regions.

9. A process for manufacturing a micromachined device, characterized by the steps of:

forming a cavity in an intermediate layer arranged on top of a substrate, said cavity being delimited at the bottom by said substrate and laterally by bottom fixed regions that are formed in said intermediate layer and defining fixed electrodes and extending towards the inside of said cavity;

putting said intermediate layer on a semiconductor body, thereby closing said cavity;

forming trenches in said substrate so as to define an oscillating element above said cavity and to separate said oscillating element from top fixed regions, said oscillating element having mobile electrodes extending towards said top fixed regions in a staggered way with respect to said fixed electrodes.

10. The process according to claim 9, wherein said step of forming a cavity comprises: forming said intermediate layer on top of said substrate by growth or deposition of semiconductor material; and removing selectively said intermediate layer for forming said cavity.

11. The process according to claim 10, wherein said step of removing selectively said intermediate layer further comprises digging said intermediate layer for reciprocally insulating said bottom fixed regions.

12. The process according to claim 9, wherein before forming said intermediate layer, the following steps are carried out:

forming a first insulating layer on top of said substrate; and

forming openings in said first insulating layer;

and wherein said step of forming said intermediate layer comprises forming contact portions extending inside said openings and in direct electrical contact with said substrate.

13. The process according to claim 12, wherein, after said step of forming trenches, the step of removing said first insulating layer underneath said oscillating element is performed.

14. The process according to claim 9, wherein said step of putting said intermediate layer comprises the steps of:

bonding said intermediate layer to said semiconductor body; and

thinning said substrate.

15. The process according to claim 14, wherein said step of bonding comprises forming a bonding structure on top of said semiconductor body and fixing said intermediate layer to said semiconductor body through said bonding structure.

16. The process according to claim 15, wherein said bonding structure comprises an insulating layer on top of said semiconductor body.

17. The process according to claim 15, comprising, before said step of forming a bonding structure, the steps of forming electronic components in said semiconductor body, forming an insulating layer on top of said semiconductor body, forming electrical-connection regions in said insulating layer, said bonding structure comprising pads connected electrically to said electrical-connection regions, said step of bonding comprising bonding said pads to at least said bottom fixed regions.

18. The process according to claim 14, wherein, after said step of thinning, metal regions are formed on top of said substrate.

19. The process according to claim 9, wherein said step of forming trenches further comprises removing selective portions of said substrate to form mutually insulated top regions.

20. A micromachined device and corresponding fabrication procedure, substantially as described with reference to the annexed figures.

21. A micromachined device, comprising:

a first substrate;

an intermediate layer adjacent the semiconductor substrate, the intermediate layer having first and second fixed control regions formed spaced apart from one another in the intermediate layer to define a cavity between the regions, each region having fixed control elements extending into the cavity along at least a portion of an edge defining the cavity;

a second substrate adjacent the intermediate layer, the second substrate including,

a movable element formed adjacent the cavity and having movable control elements extending into the cavity, the movable control elements being staggered relative to the fixed control elements, and

third and fourth fixed control regions formed separate from the movable element, the third and fourth fixed control regions being coupled to the first and second fixed control regions, respectively, in the intermediate layer.

22. The micromachined device of claim 21 wherein the movable element comprises:

an oscillating platform having mobile electrodes formed along a first edge that extend toward the third fixed control region and formed along a second edge that extend toward the fourth fixed control region; and

first and second arms formed along third and fourth edges of the platform; and

first and second anchor regions coupled to the first and second arms, respectively.

23. The micromachined device of claim 21 further comprising at least one metal contact formed on each of the third and fourth fixed control regions.

24. The micromachined device of claim 21 further comprising a bonding structure formed between the first substrate and the intermediate layer.

25. The micromachined device of claim 24 wherein the bonding structure comprises a bonding oxide layer.

26. The micromachined device of claim 24 wherein the bonding structure comprises:

an oxide layer formed on the first substrate; and

bonding regions formed on the oxide layer.

27. The micromachined device of claim 26 further comprising:

active regions formed in the first substrate, the active regions having an opposite conductivity type of a conductivity type of the first substrate; and

electrical contact regions formed in the oxide layer, each electrical contact region interconnecting a respective bonding region and active region.

28. An electronic system including a micromachined device, the micromachined device comprising:

a first substrate;

an intermediate layer adjacent the semiconductor substrate, the intermediate layer having first and second fixed control regions formed spaced apart from one another in the intermediate layer to define a cavity between the regions, each region having fixed control elements extending into the cavity along at least a portion of an edge defining the cavity;

a second substrate adjacent the intermediate layer, the second substrate including,

a movable element formed adjacent the cavity and having movable control elements extending into the cavity, the movable control elements being staggered relative to the fixed control elements, and

third and fourth fixed control regions formed separate from the oscillating element, the third and fourth fixed control regions being coupled to the first and second fixed control regions, respectively, in the intermediate layer.

29. The system of claim 28 wherein the system comprises an optical system.

30. A method of forming a micromachined device, comprising:
forming an intermediate layer on a first substrate;
forming a cavity in the intermediate layer;
bonding a removable surface of a second substrate to the intermediate layer;
forming in the second substrate a movable element adjacent the cavity; and
removing through the second substrate a portion of the removable surface adjacent the cavity to allow the movable element to move.

31. The method of claim 30 wherein removing through the second substrate a portion of the removable surface comprises:
removing a portion of the second substrate;
forming trenches in the second substrate; and
removing the portion of the removable surface through the trenches.

32. The method of claim 31 wherein removing the portion of the removable surface through the trenches comprises performing reactive ion etching.

33. The method of claim 30 further comprising forming first and second fixed control regions in the intermediate layer, the first and second fixed control regions being spaced apart to define the cavity between the control regions.

34. The method of claim 30 further comprising forming third and fourth fixed control regions in the second substrate separate from the movable element.